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Using GIS as a Decision Support Tool for Transportation Feasibility Studies

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Outline

- Working from the Consultant's Perspective
- Using GIS to Support Decision Making
 - Procedural Role in NEPA
 - Decision support role for the design process
- Expanding GIS Applications in Transportation
 - US 285 Feasibility Study
 - Project overview
 - Database design and data collection
 - Toolkit outline & examples
- Conclusions



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Using GIS as a Consultant

- Perspective of GIS program leader for environmental, planning and design consultant

GIS program began with Environmental Planning 6 years ago

Use of GIS is project specific

Currently part of Infrastructure (design) group

Focus on supporting all Transportation programs



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GIS use for NEPA

- First application of GIS at Carter & Burgess

Data collection focuses on the potentially affected resources

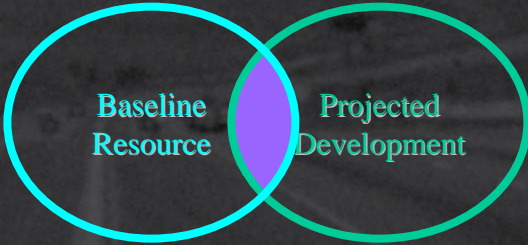
- Wetlands, prime & unique farmlands, sensitive noise receptors, Section 4F, Historic and Cultural resources, etc.

List of resources is determined by reviewing agencies (FHWA, FTA)



GIS Methodology for NEPA

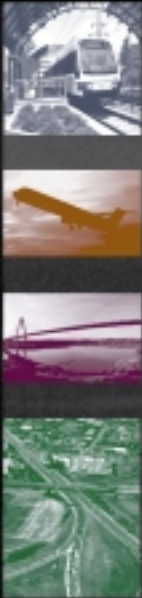
➤ Conventional GIS –
“study areas”
overlays to produce new information



Baseline Resource

Projected Development

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Application of GIS to Supporting Design Work

➤ How can GIS be used to support the design process from planning through conceptual and preliminary design?

GIS can have a large role in both the development of Purpose and Need and in the alternatives development process.

- What type of solutions should be sought?
- Where should improvements be targeted?
- Do proposed alternatives address the criteria that have been set?

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Methodology


- We must focus on GIS as a *process*: the development of data for project or enterprise in order to better manage, model and understand issues
- Process is deployed throughout the project
- Role of GIS staff is to marry the process to the technology



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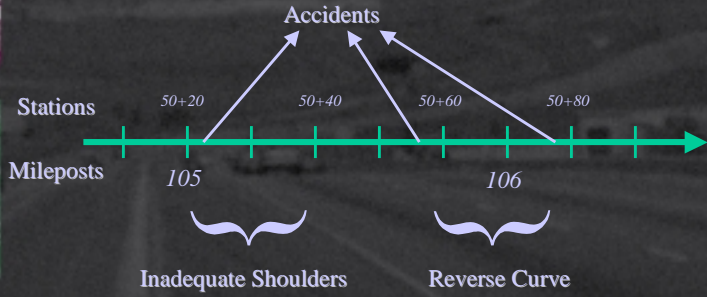
Technical Methodology

- Data must be collected to input into decisions - database of roadway conditions and characteristics
- For transportation and other linear applications data may also be stored using Linear Referencing Systems (LRS) - either mileposts or stationing

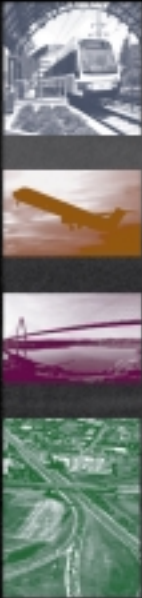


Linear Referencing/Dynamic Segmentation

- GIS for Transportation
 - Map the connections between places
 - Create events along a route



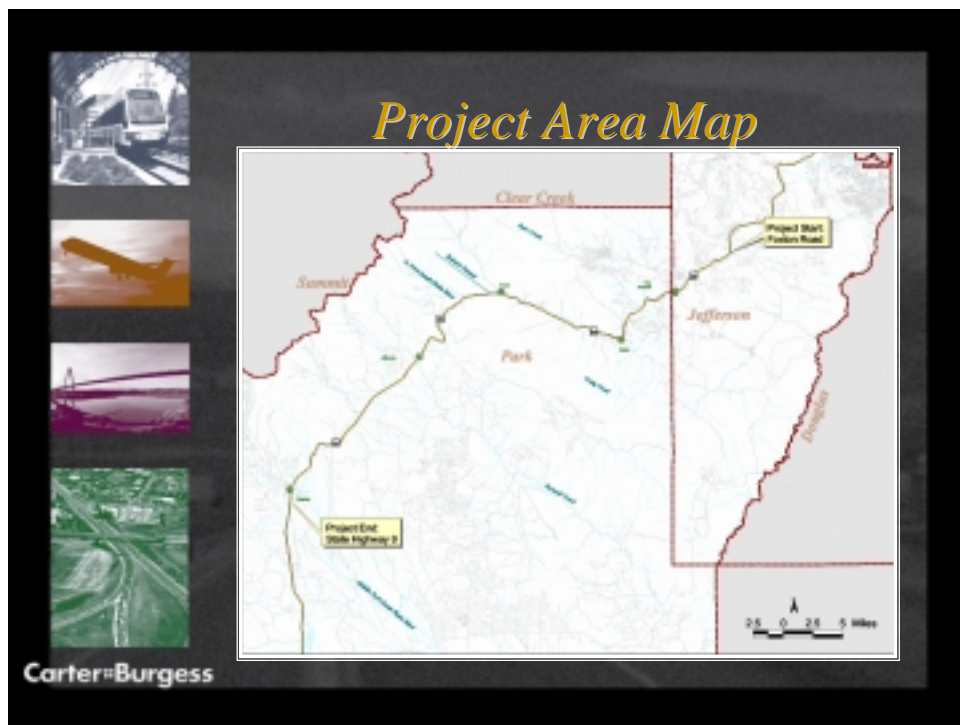
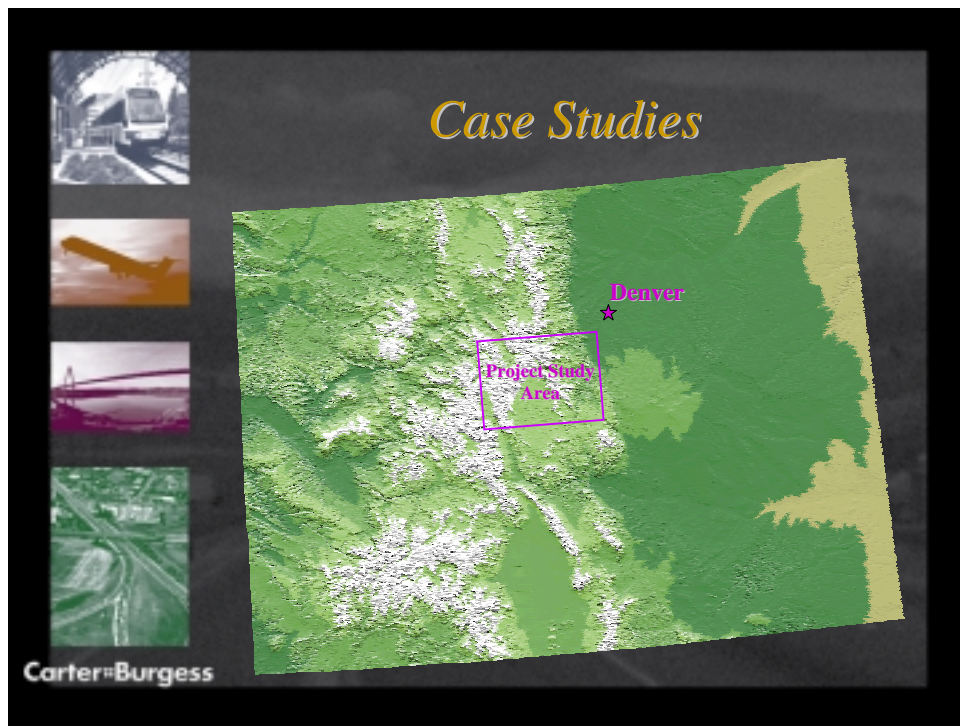
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Case Study: US 285 Feasibility study

- 52-mile highway feasibility study currently underway provides examples for how GIS can contribute to initial design decision-making
- Large study area with little available data
- GIS used to develop database of roadway conditions, document environmental issues, manage property information along corridor, and to help develop and screen conceptual level alternatives

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US 285 Feasibility Study

- Objective: Need to develop clear purpose for future projects
 - Many potential long-term projects
 - Limited budget
 - DOT would like early action
- Solution
 - GIS database of roadway conditions from GPS
 - ArcView toolkit for analysis

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Data Collection Program


- Use of resource grade GPS equipment for conditions survey in conjunction with other existing data sets
- 6 week program of data collection
 - Multiple passes along roadway with traffic engineers and civil designers
- Layers include
 - Physical features (drainage, guard rail)
 - Deficiencies (excessive curves, grade, lack of shoulder or clear zone)
 - Traffic (Accesses, signage, volumes, travel times)
- All data stored in single Access database using linear referencing applied from ARC/INFO



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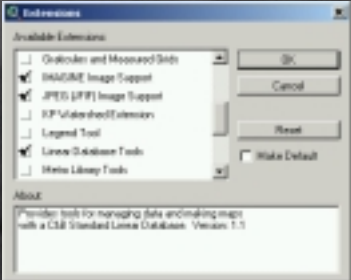
ArcView Toolkit

- ArcView is used for display and analysis
- Extension was developed to simplify interface of event-based data
- Additional tools are being added to support specific analyses and data loading functionality
- Functionality also available in ArcGIS

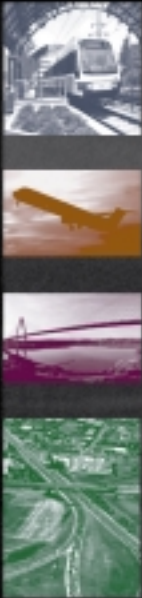


Tool Kit

- Written as an ArcView extension in Avenue
- Reads event based data from Access database - can be any ODBC compliant database
- Eliminates requirement for user to understand the procedures for creating event based data




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Analysis

- Cartographic display and queries
- Point-on-line overlays
 - Relies on spatial joins available in Avenue
 - Line-on-line overlays require ARC/INFO dynamic segmentation functions
- Specific tools are being coded around these capabilities

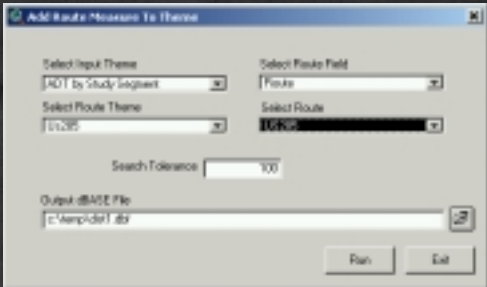
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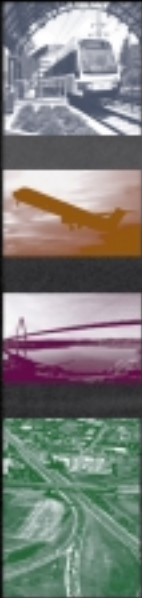


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Data Conversion

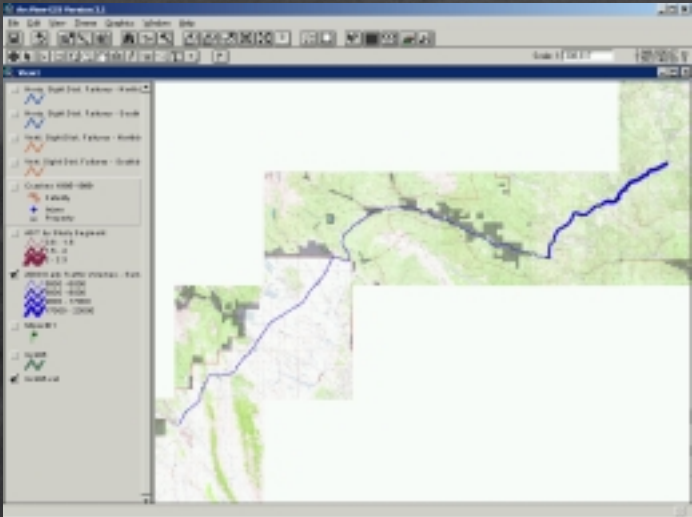
- New themes can be constructed for the database from CAD, GPS or other data
- Data can be converted from ARC/INFO routes to PolylineM class





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Demonstration





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Summary

- GIS should function as more than pretty pictures or front-end to asset management programs
- GIS functions as a key solution for conceptual design
 - Analytical environment to optimize solutions
 - Facilitate communication with project team
- GIS can take advantage of great amount of detailed information rather than be buried in it
 - Detail can be scaled to the problem (one corridor vs. large network)
 - Answers don't necessarily lie in the individual details, but control of detailed information is key